Space Weather Technical Forecast

Issued on Wednesday, 24 August 2022 at 13:17 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Active fluence likely persisting till day 3. Slight chance of R1 Radio Blackout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Very Low, with no significant flares observed. There are four sunspot regions on the visible disc, one of which is unnumbered. The largest and most complex region remains AR3085, however many of its trailing and intermediate spots started to vanish a little, the group somewhat reducing in size as a result. AR3086 continued to develop and grow, becoming more elongated although it conserved the same amount of spots. This region is however showing a slightly more complex magnetic structure. AR3087 and the new region in the northeast quadrant are both simple Alpha/Hsx. No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR at L1, followed a broad declining trend over the last 24 hours, reducing erratically from 450 to around 380km/s as the influence from any recent weak coronal hole or transient enhancement decayed. Density was average or slightly below average. The total magnetic field strength (IMF) Bt, was generally weak, between 5-7nT, with only small fluctuations from the north-south component. The phi angle was negative (towards the Sun). Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV), as measured by GOES-16, was at Background levels. The high energy electron flux (greater than 2 MeV) remained at High levels, with a peak of 4360 pfu at 23/1455 UTC. The 24-hour integrated electron fluence remained above the the Active threshold (1e8 integrated pfu) throughout the period, displaying a rather flat trend. A value of 2.64e8 integrated pfu was observed at 24/0001 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to remain Very Low to Low through this period, with only a slight chance of M-class flares.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in this forecast. Solar winds are expected to slowly decline towards background levels with geomagnetic activity remaining largely Quiet. A slight enhancement is possible at the end of day 3 (26th) and into day 4 (27th) under the influence of CH18/+ but its impact on geomagnetic activity should be minor, with perhaps a couple of Unsettled or Active intervals.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is forecast to remain at Background levels. The high energy electron flux (greater than 2 MeV) is currently at High levels but is expected to see a decrease in peak values to finally drop to background and moderate levels. Consequently the associated 24-hour fluence is expected to display a decreasing trend while remaining Active through days 1-3, before coming back below

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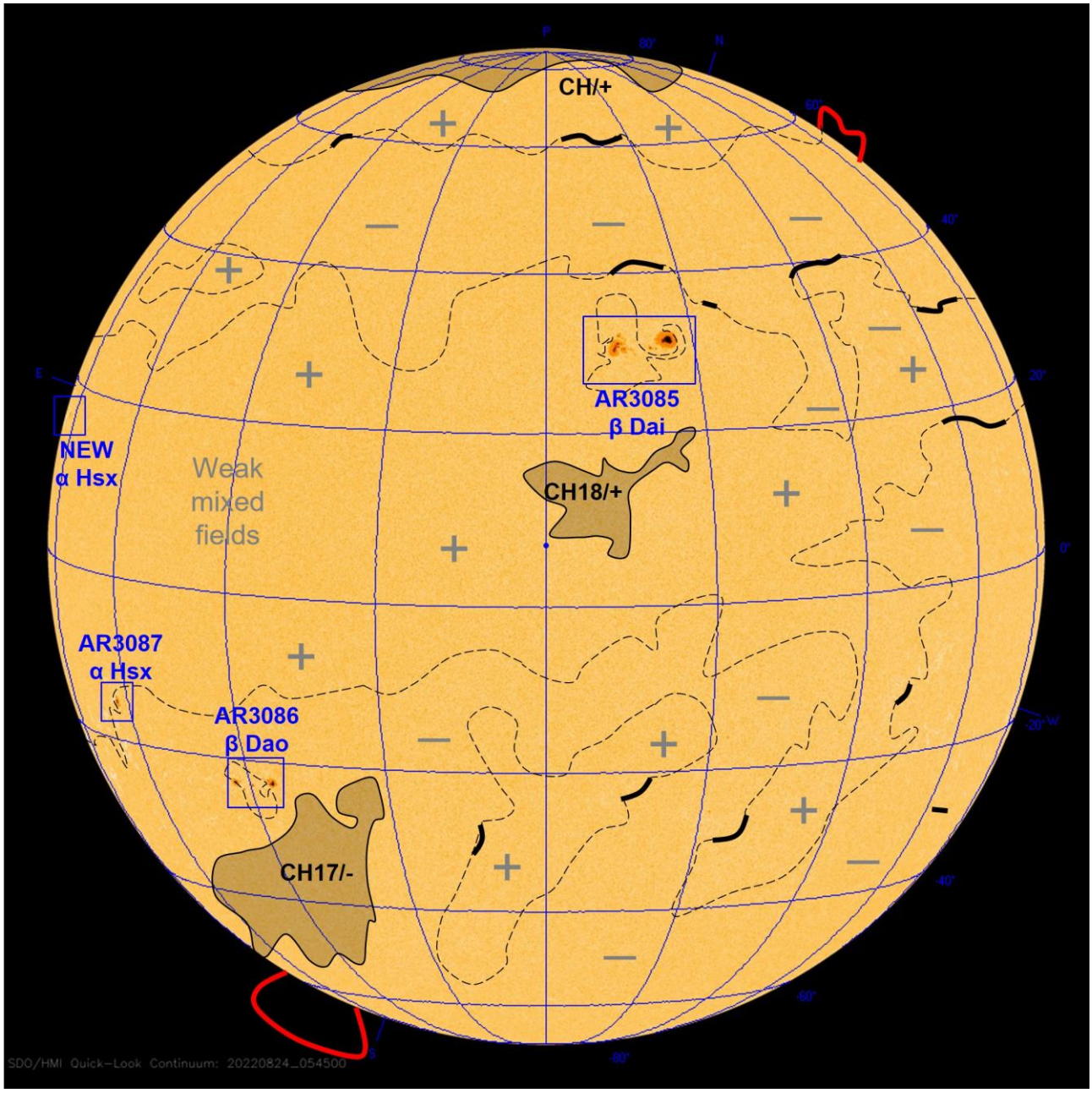
threshold on day 4.

Figure 1. Solar Analysis Valid 24/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth-directed CMEs feature in this forecast.

Solar winds are currently at slow-ambient levels, around 380-390 km/s, with no significant enhancements expected and a geomagnetic activity remaining largely Quiet. The next coronal hole worth of note is CH18/+, expected to become geoeffective at the end of day 3 and into day 4 (26th and 27th). It is a recurring feature, however it achieved very little in terms of speed and geomagnetic activity on the last rotation and despite being slightly larger this time round, its impact is expected to remain minor, with only a couple of Unsettled or Active intervals.

The MOSWOC Enlil incorrectly suggests the presence a coronal hole high speed stream on the 24th (today) but this is considered to be an artefact of the model, perhaps representing something that used to occur periodically.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	5	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

NIL

Figure 2: SWPM (Solar Wind Persistence Model, considered to provide good guidance.

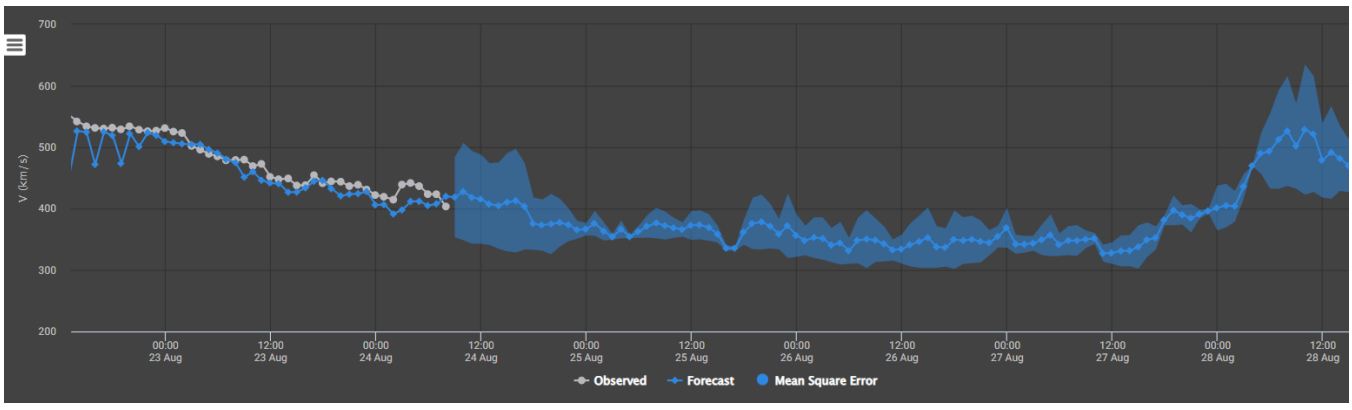

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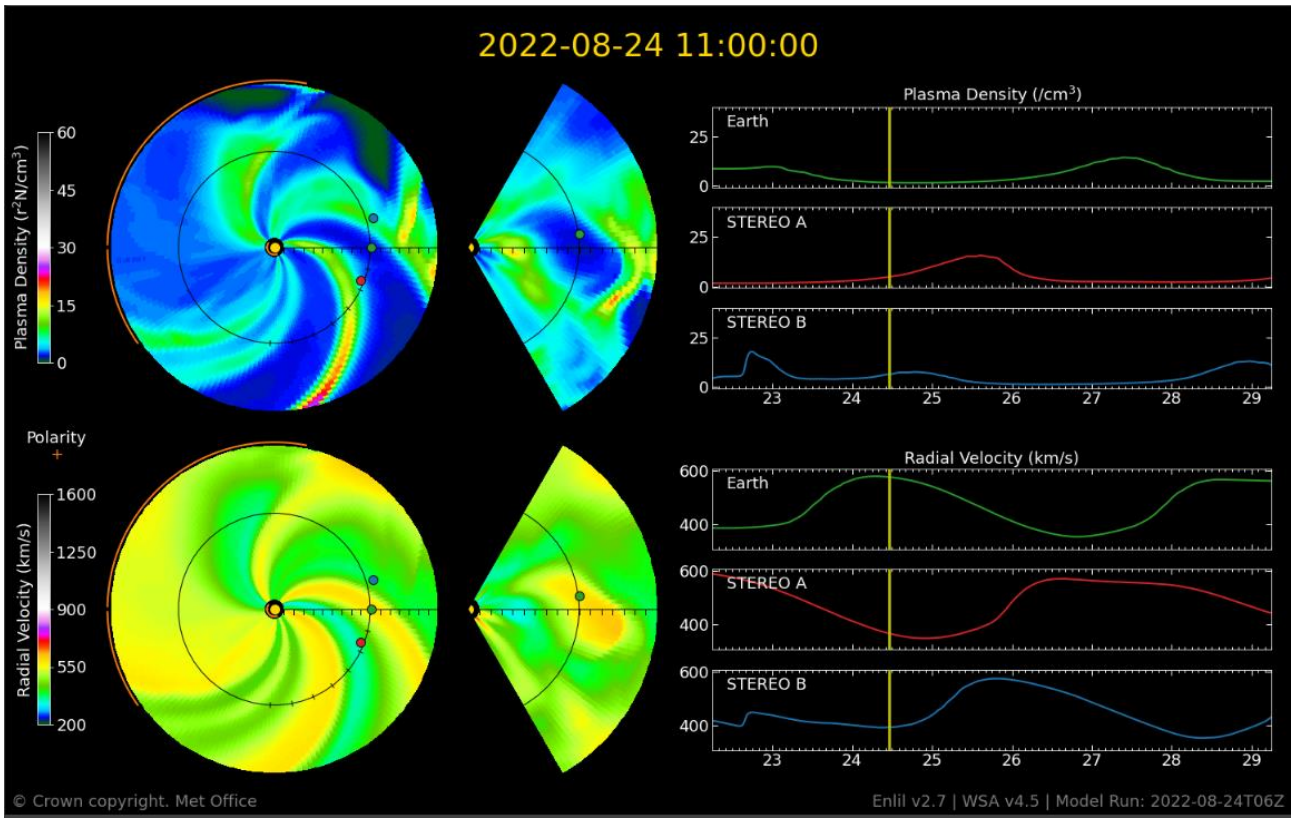
Figure 3: Enlil showing an imaginary fast speed stream affecting Earth today



Radio Blackouts - X-Ray Flares:

Solar activity has been Very Low, with no significant flares. There are four sunspot regions on the visible disc, one of which is unnumbered. The largest and most complex region remains AR3085, however many of its trailing and intermediate spots started to vanish a little, the group somewhat reducing in size as a result. AR3086 continued to develop and grow, becoming more elongated although it conserved the same amount of spots. This region is however showing a slightly more complex magnetic structure. AR3087 and the new region in the northeast quadrant are both simple Alpha/Hsx

Far sided products are not indicating any potential for further regions to rotate onto the visible disc in the immediate future. Therefore solar activity is likely to remain Very Low to Low through this period with only a slight chance of M-class flares, mostly from AR3086 as it continues to grow in size and complexity.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	15	15	15	15
Very Active	R3 to R5 X Class	No	1	1	1	1

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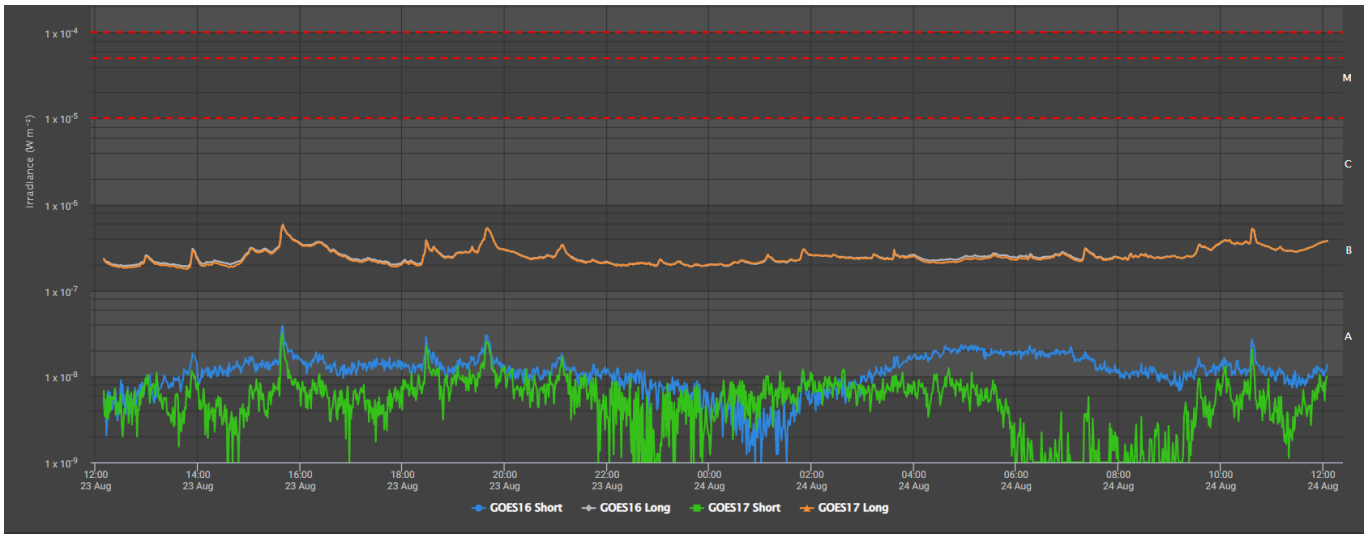
Figure 4: Latest X-ray Flares, as observed by GOES-16



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels and is expected to remain at this level through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

High Energy Electrons Event (≥ 2MeV):

The high energy (greater than 2 MeV) electron flux as measured by GOES-16 is currently high after recent coronal hole and CME enhancements to the solar wind environment. With no further enhancements expected which could potentially affect the electron counts, a gradual reduction in peak values is more likely than not, particularly as the solar wind speed eases over the coming days. The electron flux should eventually drop to background and moderate levels at the end of the period although confidence is low with regards to timings.

The associated fluence is expected to display a decreasing trend while remaining Active through days 1-3, before coming back below threshold on day 4. While the trend of the latest REFM is accepted, it is considered to under-estimate the fluence levels, with values expected to remain above the Active threshold a bit longer than shown.

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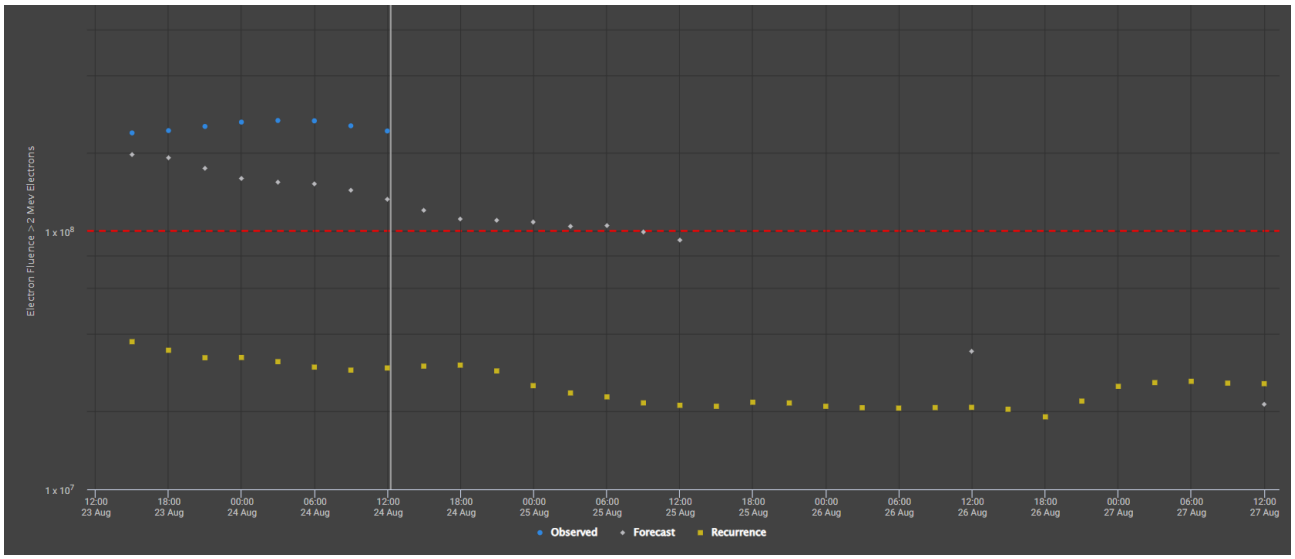
GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	Yes	100	80	60	40
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 5: Latest REFM output, considered to under-estimate the fluence values.



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